# The Geometry of Qubit Decoherence: Linear vs. Nonlinear Dynamics in the Bloch Ball

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***Abstract***

*Two complementary approaches to the GKSL equation for an open qubit will be presented. The first, based on the linear structure of the equation, leads to explicit solutions illustrated by mixed-state trajectories in the Bloch ball, including non-random asymptotic fixed points and the appearance of exceptional points. The second approach, which exploits the underlying SU(2) symmetry, produces a nonlinear dynamical system in which the angular evolution decouples from radial dissipation. This symmetry-based perspective offers a promising route toward generalisations to open qudits.*

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